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**Submission date:** 12-Jul-2021 11:43AM (UTC+0700)

**Submission ID:** 1618540282

**File name:** paper\_enfer.pdf (337.57K)

**Word count:** 3288

**Character count:** 15434



## Acceptability and protein value of snack made of cork fish flour and sweet potato flour for tuberculosis (TB) patients in Public Health Center of Pacerakang Makassar<sup>☆</sup>



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Received 8 November 2019; accepted 2 June 2020

### KEYWORDS

Acceptability;  
Snack;  
Snakehead fish flour;  
Sweet potato flour;  
TB patient

### Abstract

**Objective:** This study aimed to determine the acceptability (level of preference) of TB patients and the value of protein of snack made of cork fish flour and sweet potato flour.

**Method:** This research was conducted in 2019 in the working area of Makassar Pacerakang Public Health Center. This study uses a quasi-experimental design to determine the acceptability of TB patients to a snack made of cork fish flour and sweet potato flour. Data collection on the nutritional value of formulas is obtained through laboratory testing, while data for acceptability was obtained through a questionnaire to the participant after being given a snack.

**Result:** TB patients mostly like the snacks given organoleptically, from the aspects of taste, aroma, texture, and color. The value of protein snacks is an average of 6.16 g per serving.

**Conclusion:** This study concludes that this snack is acceptable for TB patients and can be recommended as side food to increase their nutritional intake.

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### Introduction

Pulmonary tuberculosis (TB) is a disease that has long been in Indonesia and has not been appropriately resolved. Healing requires a long time and compliance to take medication. Most TB sufferers are in the productive age group in densely populated settlements and poor environmental health. According to WHO, Indonesia ranks fourth in

<sup>☆</sup> Peer-review under responsibility of the scientific committee of the 4th International Conference Hospital Administration (ICHA4). Full-text and the content of it is under responsibility of authors of the article.

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<sup>1</sup> <https://doi.org/10.1016/j.enfcli.2020.06.075>  
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the world with the number of sufferers in 2011, reaching 0.38–0.54<sup>1</sup> million.

Makassar City Health Office stated that in 2009 TB patients reached 9916 people. This number is based on the recording and reporting of 3568 patients in the community health center and 4412 in hospital.

In addition to drug administration, TB patients need to be supported by adequate food intake so that weight loss does not occur, which results in a decrease in nutritional status. Menu analysis of TB patients at Makassar Labuangbaji Hospital conducted in 2017 found that the food provided did not match the patient's needs. Meeting the food needs of TB patients can be in the form of complete food and snacks. TB sufferers need high energy and protein consumption for physiological fulfillment and strengthen the immune system.<sup>2</sup>

High protein products can be made by utilizing various food sources of protein, such as cork fish.<sup>3</sup> Cork fish, other than consumed as a side dish, is usually processed conventionally. Cork fish is a food that is easily damaged, so other alternatives are needed in its processing to increase its durability, one of which is made in the form of flour. High protein content in fresh cork fish<sup>4</sup> and cork fish flour can be used as an alternative material in making high protein products for TB patients.

Based on the description above, this research has been carried out to determine the protein value and acceptability (preference) of snacks with the formula of cork fish meal and sweet potato flour by TB patients at Pacerakkang Public Health Center.

## Method

This study uses a quasi-experimental design. It begins with the draft formula of cork fish flour and sweet potato flour for the development of various snacks that are commonly modified in ingredients. This snack is designed with a certain energy and protein content that can be given to TB patients.

The trial was conducted by making snacks from two flour formulas with protein values of 10–12 g per serving. Snacks are designed to have 200–300 kcal energy and 10–12 g protein. The formula used, namely formula one and two that differ by the ratio of cork fish and sweet potato flour. The results are assessed from energy and protein content as well as taste, aroma, and texture. The snacks made are sticks, chocolate cookies, tofu balls, and Taripang (traditional Indonesian food).

The study was conducted by testing the acceptability or likeness of TB patients on four snacks that have been made. The steps taken are as follows; (a) each snack is packaged and coded, (b) prepares a questionnaire to be filled in by the sample (Tb patients), (c) the sample is collected at a representative place (not noisy, quiet) in the Pacerakkang Public Health Center hall, (d) the sample is given an explanation how to fill out the questionnaire, (e) snack and drinking water are served, (f) the samples are welcome to test one snack then drink and continue the next snack, and (g) the samples fill out the questionnaire.

## Population and sample

The population used in this study was TB patients in the Pacerakkang puskesmas area. While the sample was TB patients registered at Pacerakkang Health Center, who received DOTS treatment with a total of 30 people. This study uses a non-probability sample by taking the entire population as a sampling (saturated sampling).

## Data collection and analysis

This study uses an experimental method where data on the nutritional value of macro snacks is obtained by laboratory analysis. Data on consumer acceptance of snacks is collected by filling out questionnaires covering aspects of taste, aroma, color, texture, and serving size. Data analysis was performed and presented descriptively with narration and then compared with theories and similar research results.

## Result

### Formula and product making

The preparation phase is carried out by producing two types of flour, namely cork fish flour and sweet potato flour. Cork fish flour production is done by; (1) choose fresh cork fish and then cleaned by removing gills, stomach contents, and scales. (2) steam the fish for 20–30 min until perfectly cooked, then separate the flesh from the fish bones and shred the flesh. (3) grilled fish with a temperature of 50–60 °C for 6–8 h, until dry and then ground. Sweet potato flour making is done by; (1) Choose fresh, good quality sweet potatoes, then wash thoroughly then thinly sliced. (2) dry the sweet potatoes under the sun (2–3 days) (3) grind then sift.

The next step is making two formulas of sweet potato flour and cork fish meal. The first formula with 75% sweet potato flour composition and 25% cork fish flour. The following formula with a composition of 60% sweet potato flour and 40% cork fish meal. Both formulas were then tested for protein, fat, and carbohydrate content at the Makassar Center for Health Laboratory. The two formulas were also assessed for their organoleptic values, which included taste, aroma, color, and texture.

### Flour nutrition analysis results

The results of the analysis of energy, protein, fat, and carbohydrates per 100 g of snacks and organoleptic observations in both formulas can be seen in [Tables 1 and 2](#).

### The result of the nutrition analysis of the snack

Four snack recipes are made for each formula, namely sticks, tofu balls, chocolate cookies, and Taripang. For recipes with the formula two, fish flavor arises more than formula one. For salty taste can still be accepted by study participants, but for sweetness, the results are different. This is because, at the beginning of eating a sweet snack, the aroma and taste of the fish are not too pronounced, but

**Table 1** The results of the analysis of energy and nutrients content of both formulas per 100g.

Parameters	Formula 1 (25% cork fish flour)	Formula 2 (40% cork fish flour)	Average
Protein (g)	21.25	32.06	26.66
Fat (g)	1.74	2.21	1.98
Carbohydrates (g)	41.21	31.96	36.59
Fiber (g)	2.05	2.84	2.45
Energy (kcal)	265.62	275.97	270.80

**Table 2** Organoleptic test of both formulas per 100 g.

Parameters	Formula 1	Formula 2
Taste	Taste of sweet potato flour	Taste Sweet potato flour and a little fish taste
Aroma	The aroma of sweet potato flour	The aroma of sweet potato flour, the longer it smelled, the more the fish smelled
Texture	Smooth	Smooth
Color	Yellowish white	Yellowish white

**Table 3** The results of the analysis of energy and nutrient content of snacks for each recipe with formula 1.

Snack	Energy (kcal)	Protein (g)	Fat (g)	Carbohydrates (g)	Portions
Stick	856.82	33.87	26.28	119.65	5 @ 50 g
Chocolate cookies	2350.37	48.53	115.77	273.81	11 @ 50 g
Tofu Balls	715.41	32.72	32.5	62.44	6 @ 50 g
Taripang	1052.62	29.95	24.94	176.3	6 @ 50g

the last moment before the snack is swallowed, the sweet taste mixed with the aroma and taste of the fish, this is <sup>2</sup> It to be somewhat disturbing to the study participants. The results of the analysis of energy, protein, fat, and carbohydrate values in snacks with formula one are presented in Table 3.

The results of the analysis of the energy, protein, fat and carbohydrate content of one snack for an average of one serving can be seen in Table 4.

The analysis result of energy, protein, fat and carbohydrate value of snack made with formula 2 can be seen in Table 5.

The results of the analysis of the energy, protein, fat and carbohydrate content of snack made with formula 2 for an average of one serving can be seen in Table 6.

The average value of energy, protein, fat, and carbohydrates per serving is presented in Table 7.

### Acceptability

Acceptability test of snack made with cork fish flour and sweet potato flour was followed by 30 participants of TB outpatients in the Public Health Center of Paccerakang. The test was to see whether the participant like or do not like the product in several parameters, namely taste, aroma, color, and texture, as presented in Table 8.

### Discussions

From the result of energy and nutrient content analysis, it can be seen that in 100 g, the average energy of each formula is 270.80 kcal while the protein is 26.66 g. These formulas have high potential to be developed into various snacks. The developing method used was by modifying and substituting some parts of the snack that will be made, especially the flour. For all the snacks made in this study, the flour has been modified (Generally wheat flour, rice flour, and glutinous rice flour) from the recipe commonly used. The change that made was by replacing 50% of the common flour using in the normal snack recipe by the combination of cork fish flour and sweet potato flour.

Almatsier (2017), in his book of "Penuntun Diet" stated that snacks could be given to provide 20% of recommended daily intake for 2 times serving with the energy of 260–300 kcal and protein of 10–12.5 g.<sup>5</sup> The result of product making from 2 formulas used (Table 7) provides 170.62 kcal of energy and 6.16 g of protein per serving with a weight of 50 g. If for 1 day, the snack was given twice, this product provides the energy of 341.24 kcal and protein of 12.32 g. This is in line with the study that stated that snack consumption positively correlated with energy consumption, fat consumption, and BMI (Body Mass Indeks) status of students.<sup>6</sup> While another study found out the difference in nutrition adequacy level and nutrient status of TB patients with sputum (AFB+) and sputum (AFB-), it is also

**Table 4** The analysis result of energy and nutrient content of *snack* made with formula 1 (for 1 serving).

Snack	Energy (kcal)	Protein (g)	Fat (g)	Carbohydrates (g)	Portions
Stick	171.36	6.77	5.26	23.93	5 @ 50 g
Chocolate cookies	213.67	4.4	10.52	24.89	11 @ 50 g
Tofu Balls	119.24	5.45	5.42	10.40	6 @ 50 g
Taripang	175.44	4.99	4.20	29.38	6 @50g
Average per serving	169.93	5.40	6.35	22.15	

**Table 5** The analysis result of energy and nutrient content in each *snack* made with formula 2.

Snack	Energy (kcal)	Protein (g)	Fat (g)	Carbohydrates (g)	Portions
Stick	867.17	44.68	26.75	110.4	5 @ 50 g
Chocolate cookies	2360.72	59.34	116.24	264.56	11 @ 50 g
Tofu Balls	720.59	38.12	32.74	57.64	6 @ 50 g
Taripang	1062.62	40.76	25.41	166.36	6 @50g

**Table 6** The analysis result of energy and nutrient content of *snack* made with formula 2 (for 1 serving).

Snack	Energy (kcal)	Protein (g)	Fat (g)	Carbohydrates (g)	Portions
Stick	173.43	8.94	5.53	22.08	5 @ 50 g
Chocolate cookies	214.61	5.40	10.57	24.1	11 @ 50 g
Tofu Balls	120.1	6.53	5.46	9.61	6 @ 50 g
Taripang	177.10	6.79	4.24	27.73	6 @50g
Average per serving	171.31	6.92	6.45	20.88	

**Table 7** The average value of energy and nutrient of two formulas per serving of *snack* (Average per serving is 50 g).

No.	Formula	Energy (kcal)	Protein (g)	Fat (g)	Carbohydrates (g)
1	Formula 1	169.93	5.40	6.35	22.15
2	Formula 2	171.31	6.92	6.45	20.88
	Rata rata kedua formula	170.62	6.16	6.40	21.52

**Table 8** The acceptability test result of *snacks* made with cork fish flour and sweet potato flour.

Aspects	Stick	%	Chocolate cookies	%	Tofu Balls	%	Taripang	%
<i>Taste</i>								
Like	19	63.3	27	90	28	93.3	20	66.6
Don't like	11	36.7	3	10	2	6.7	10	33.4
<i>Aroma</i>								
Like	17	56.6	22	73.3	25	83.3	26	86.6
Don't like	13	43.4	8	26.7	5	16.7	4	13.4
<i>Color</i>								
Like	27	90	27	90	27	90	26	86.6
Don't like	3	10	3	10	3	10	4	13.4
<i>Texture</i>								
Soft	19	63.3	9	30	18	60	17	56.6
Hard/Rough	11	36.7	21	70	12	40	13	43.4

needed to modify the snack in the various recipe to avoid feeling bored if given for a long time.

Some examples of snacks that use sweet potato flour as a substitute are baked pastel,<sup>7</sup> patiseries,<sup>8</sup> nastar,<sup>9</sup> and food bar.<sup>10</sup> The difference between this study and other studies is the use of cork fish meal in sweet potato flour formula to increase protein content. Other high-protein ingredients such as soybeans, mung beans, Tolo beans, Gude beans, kidney beans, or tempeh can also be used.

The acceptance or likeness of the sample for the products of these two formulas is that more than 50% of the sample likes in terms of taste, color, aroma, and for the texture expressed as soft by the sample. This is in line with the results of the study where the composition of 50% sweet potato flour and 50% wheat flour in making baked pastels provides the highest quality pastel results and is preferred in terms of color, taste, and texture,<sup>7</sup> while other studies have found that the proportion of purple sweet potato flour and red bean flour has an effect on texture and not on the aspects of color, aroma, and taste. The best acceptability is the ratio of purple sweet potato flour and red bean flour 90%:10%.<sup>10</sup> While in the making of Nastar with yellow sweet potato flour substitution, the preferred sample was 74.43% in Nastar with a ratio of 60% wheat flour and yellow sweet potato flour 40%.<sup>9</sup> This study is in line with the results of research that uses the composition of 30% sweet potato flour and 70% wheat flour for all products (Sweet Potato Pizza and Rainbow Bread) where the acceptability for Sweet Potato Pizza 90% of 30 samples states "yes", for Rainbow Bread all 30 samples said "yes".<sup>8</sup>

The weakness of the product produced is the taste of fish in sweet snacks, where when swallowing or the end of chewing arises, the fish's aroma or taste is disturbing, even though the study participants said they liked it. The results of this study indicate that making various snacks made from sweet potato flour can be developed by substituting wheat flour and generally being accepted by the participant. The low value of protein content in sweet potato flour can be increased by the formulation of flour from other ingredients that are high in protein content from animal and vegetable ingredients. Vegetable ingredients do not give fishy taste or aroma like fish. This composition can be designed according to the objectives and needs of how much protein content is desired but with due regard to the aspects of taste and acceptability of consumers. Legume flour and its processed products can be recommended for substitution in sweet

potato flour. This bean flour is high in protein and does not provide the taste and aroma of fish, especially for sweet cakes.

## Conclusion

The conclusion of this study is that this snack is acceptable for TB patients and can be recommended to increase their nutritional intake.

## Conflict of interest

The authors declare no conflict of interest.

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